Attachment A1

# Project and Engineering Support Services

Statement of Work

Feb 1, 2011

National Aeronautics and Space Administration

Ames Research Center

P.O. Box 1000

Moffett Field, California 94035-1000

## Table of Contents



ATTACHMENT A1

## 1.0 INTRODUCTION

This procurement is for all phases of the NASA project lifecycle (Pre-phase A to Phase E) and any parts therein for Ames' projects. This includes proposal development, project management, engineering, design, fabrication-integration-testing, and deployment/mission operations services for NASA-Ames Research Center (ARC). The work will primarily be performed on-site at ARC, however, there may be some instances when work will be performed off-site, such as at other NASA centers, other Government agencies, commercial facilities, and other international facilities. The work for this procurement will range from small tasks on the order of $1000 to large tasks on the order of several million dollars per year. Work will include assignments for which the

Contractor is responsible for performing a task at the project level, leading the development of a proposal, or delivering an end-to-end system.

Section 2.0 of this SOW describes the relevant applicable documents. Section 3.0 describes the technical requirements to be performed under this contract. Section 4.0 describes the management and administrative functions to be performed. Section 5.0 describes the operational procedures that will be followed in issuing Task Orders. Section 6.0 describes the requirement for a phase-in plan and a phase-out plan.

### 1.1 Scope

The Contract shall provide proposal development, project management, project management support, systems engineering, design and development, fabrication, testing, and mission operations support. The Contractor shall perform the following: project management, project support, systems engineering, hardware and software design and development, fabrication, integration and testing, operations, and other functions, such as procurement, receiving inspection, bonded stores, and shipping necessary to complete assigned tasks.

The Contractor shall provide management and administrative functions necessary to manage and to track the labor hours, materials, and associated costs for the tasks performed under this contract. This contract may require up to 50+ simultaneous tasks, with the number of assigned personnel generally ranging from 1 to 30 Work-Year-Equivalents (WYE) per task. The Contractor may be tasked to accomplish an entire project from conception to operation, or a specific part of a project, such as drafting, configuration management, design, analysis, fabrication, or testing. On some projects, the Contractor will be required to team with the Government in order to complete the project.

## 2.0 APPLICABLE DOCUMENTS

The Contractor shall comply with all current NASA and Ames Procedural Requirements and Directives. (http://nodis3.gsfc.nasa.gov/).

## 3.0 REQUIREMENTS

The Contractor will be tasked to perform the technical functions described in this section to produce the deliverables for each task. A deliverable may be as large as an entire system, or it can be a subset of a system, such as a board level design, an analysis, a review package, a simulation, or a report. Each assigned task and its associated deliverables will be specified on a Contract Task Order (CTO).

The Contractor shall provide all labor and materials to complete each task using Government facilities and equipment described in Section G.5, List of Installation-Accountable Property and Services. If the Government determines that GFE facilities and/or equipment are not sufficient, or where the existing skill mix is not appropriate, the Contractor shall procure the required services, equipment, and facilities.

The Contractor shall follow the procedures in the Ames Management System for the work described in this procurement, unless otherwise specified in the CTO. These procedures apply to both the Government and the Contractor, and describe responsibilities, processes, and minimum requirements for the technical functions to be performed, such as project management, design, configuration management, and inspection of fabricated hardware.

In some cases the Contractor will be required to use other NASA or industry standards as defined by the customer.

### 3.1 Project Management

Project Management shall be completed in accordance with NPR 7120.5 unless otherwise specified in the CTO. Project management functions shall include coordinating and directing all resources necessary to meet the technical, schedule, and budget requirements of each CTO, as well as planning and proposal development, work breakdown structure development, project cost/schedule estimation and tracking, earned value management, project requirements development and management, communication with customers, coordination with the NASA S&MA Office, configuration management, quality assurance, and safety/risk management.

Various project reviews, such as requirements reviews, conceptual design reviews, system definition reviews, preliminary design reviews, peer reviews, critical design reviews, test reviews, operational reviews, and flight readiness reviews will be required as specified in the CTO.

The nature of the requirement for this area includes management of projects that are tasked to the Contractor as well as those aspects necessary to support the programs, projects, and activities that are performed in a mixed team environment.

### 3.2. Project Support

Examples of support typically provided by the Contractor include, but are not necessarily limited to the following –

(a) Provide technical expertise for defining, designing, developing, integrating, testing, validating and operating ground and flight platform hardware and software, mission support equipment, laboratories, and facilities.

(b) Plan, design, fabricate, conduct, analyze, and evaluate prototype engineering and scientific experiments to demonstrate the feasibility of various experimental and developmental concepts and recommend novel approaches for such work.

(c) Provide support for laboratory analyses required in the research and development work, including design, development, fabrication, integration and checkout, maintenance, and update of laboratory equipment and general

laboratory instrumentation.

(d) Assemble, checkout and, provide logistics, and other project services for off-site operation of equipment for field tests of systems.

(e) Provide collaborative technology studies and integration.

(f) Keep abreast and follow applicable safety and laboratory regulations and procedures in handling laboratory equipment and hazardous materials. Participate in the development of new procedures when required.

(g) Perform data acquisition, processing, and report preparation.

(h) Perform trade-studies, scheduling, cost estimating, preparing project plans and relevant documents. For Program/Project Cost Estimating for Space Flight Systems see APR 7120.7.

(i) Develop and maintain project management information tools and systems for projects, project managers, and senior management for management of the portfolio of projects at Ames.

(j) The Contractor shall provide configuration management services. The Contractor shall also participate on ARC Change Control Boards (CCBs) when required by the Government.

(k) The Contractor shall provide technical writing and business documentation, such as project proposals, technical papers, manuals, engineering and business reports, and presentation packages. The Contractor shall develop and maintain documentation in accordance with requirements specified in each CTO.

**3.3 Systems Engineering**

Systems Engineering shall be completed in accordance with APR 7123.1A/NPR 7123.1A unless otherwise specified in the CTO. Systems engineering shall include requirements definition, tracking, verification and validation of requirements, developing product and work breakdown structures, developing schedules, identifying and developing interface control documents, managing the technical effort, analyzing and managing risks, conducting design trade studies, creating test plans, test procedures and test reports, overseeing tests, performing life cycle cost analysis, and managing all technical documentation. Some tasks shall require familiarity with various systems engineering tools such as Windchill, and Cradle, and methods such as full system analysis and optimization, parametric and hierarchical analysis, process analysis, life cycle cost analysis, risk analysis, decision support analysis techniques and functional and data modeling.

Systems engineering shall be applied to traditional hardware and software development projects and to conceptual technology development projects where

no hardware or software is developed. The contractor shall perform trade studies simulation, risk analysis and other conceptual work as required.

### 3.4 Design and Development

The Contractor shall design and develop systems that will be used in spacecraft, aircraft, wind tunnels, information systems, centrifuges, and other research and development facilities. Design effort may be minor or major depending on the scope of the work. The work encompasses development of new systems or modifications to existing facilities and/or equipment, oversight of fabrication, and installation; integration of hardware, software, and systems; planning and performance of verification and acceptance tests; and operational support after delivery of hardware. Various engineering disciplines and systems engineering are required. Typical system operating environments include medical, commercial, airborne, and space flight (from Low Earth Orbit (LEO) to deep space.)

#### 3.4.1 Mechanical

The Contractor shall provide expertise in all areas of mechanical engineering, including machine design, structural design and analysis, and fluid mechanics. Applications typically include spacecraft design, ground-based experimental facilities (such as wind tunnels, flight simulators, and acceleration facilities (centrifuges)), life science experiment hardware and space-flight payloads (such as plant growth, animal habitat, and cell culture systems), space flight, small satellite systems, airborne and ground-based instruments, robotics, wind tunnel models, and aircraft modifications. More detailed information and requirements related on these disciplines and applications are provided below.

##### 3.4.1.1 Machine Design

Machine design includes the design and engineering of spacecraft mechanisms, instruments, spaceflight payloads, prototypes and models, test beds, facilities (wind tunnels, centrifuges, simulators), and aircraft modifications. Knowledge of mechanics, kinematics, materials selection, joint design, drive systems, heat transfer, and fabrication techniques is required. The ability to use the Pro-Engineer and SolidWorks CAD tools for modeling and drafting is required.

##### 3.4.1.2 Structural Design and Analysis

Structural design and analysis includes determination of applied loads, stress analysis of structures with factors of safety on failure modes, deflection analysis, materials selection, and analysis of joints (welded, bolted, riveted, bonded, etc.). Structural loads typically include gravitational, inertial, vibration, fluid, aerodynamic, and thermal forces. In addition to handbook stress

analysis, the ability to perform Finite Element Modeling and Analysis using MSC/PATRAN, Mechanica, MSC/NASTRAN, and Thermal Desktop is required.

#### 3.4.1.3 Fluid Mechanics

Fluid mechanics include fundamental aerodynamics analysis (i.e. lift, drag, determination of boundary layer thickness) of experimental devices installed on aircraft external surfaces or in wind tunnel airstreams and internal fluid flow through pipes, ducts, channels, and conduits, to determine precise flow parameters.

#### 3.4.1.4 Thermal Design and Analysis

Thermal design and analysis includes determination of spacecraft thermal performance using both passive and active thermal control systems in a variety of thermal environments including LEO, GEO, planetary including lunar and deep space environments. Thermal analysis of payloads onboard the ISS in a microgravity environment is required. Design knowledge of unique ground test equipment such as cryogenic chambers is required. Analysis using Thermal Desktop is required.

### 3.4.2 Electrical/Electronic

The Contractor shall supply engineering and technician expertise in all areas of electrical and electronics systems. These systems include designs for instrumentation, analog and digital sensors, embedded systems, small and large (facility) power systems, security systems, data acquisition systems, and communication systems. Typically these systems utilize a combination of Commercial-Off-the-Shelf (COTS) and custom-designed hardware/software/firmware. More detailed information on these disciplines, applications, and associated requirements is provided below.

The Government usually requires minimization of power consumption and physical size. The Contractor shall use Orcad/Cadence and LabView for electrical schematic/PCB design simulation and user interface and shall meet NASA's requirement for electrostatic discharge control.

#### 3.4.2.1 Sensors and Instrumentation Development

Designs for sensor and instrumentation systems typically include airborne and spaceborne atmospheric chemistry, atmospheric physics, remote sensing, and astronomy instruments; cryogenics systems and sensors; biomedical, chemical, and biotelemetry sensor development; and laser and optics development. The Government may require trade studies and industry searches. Custom analog and digital circuitry development emphasizing modularity and high margin-of-safety may be required by the Government.

#### 3.4.2.2 Embedded Systems

Designs for embedded systems typically include custom software and firmware development, custom hardware, data compression and storage development, electronics packaging, cable design and researching new applicable technologies. Embedded systems are typically used to control instrumentation, payloads, and/or hardware, and collect research data.

#### 3.4.2.3 Power Systems

Designs for power systems typically include power distribution systems and custom hardware/software/firmware development, commercial power supply selection for a given system, and system designs with minimal conducted and/or radiated Electromagnetic Interference (EMI).

#### 3.4.2.4 Control Systems

Control systems are typically utilized in spacecraft (Guidance, Navigation, and Control – GN&C), instruments (ground, airborne, and space), wind tunnels systems, model supports, motion simulators, centrifuges, autonomous robotic controls systems, environmental control systems, and process control systems. These systems frequently have associated instrumentation and data acquisition systems as discussed in Section 3.4.2.5. These systems may also require an enterprise level or Supervisory Control and Data Acquisition (SCADA) class system that would fall under this section as well.

##### 3.4.2.4.1 Airborne and Space Flight

Airborne and Space Flight systems are generally high performance, high reliability, servo systems, that include but are not limited to: 1) gimbaled axes positioning control system which must address relatively high stiffness, air pressure disturbances, and aircraft vibration, 2) gyro-inertial and star tracking systems with accuracy in arc-seconds, and 3) precision temperature and pressure control systems, 4) Reaction-Wheel and propulsion control systems. Requirements for applicable standards and certification processes for flight-quality hardware shall be met. System design and testing usually requires servo analysis and computer simulation. Pre-flight ground support and in-flight validation of control system performance are generally required.

#### 3.4.2.4.2 Wind Tunnels

Wind tunnel control systems are used to set flow conditions (dynamic pressure ("Q"), Mach and Reynolds numbers) via pressure, drive RPM, nozzle/flexwall, and temperature control systems, and to control the attitude and position of the test model. System components include large high-power electric motors, blowers, pumps, large valves, and compressors. Distributed control systems and programmable logic controllers are typically utilized for control design and operation for these applications.

#### 3.4.2.4.3 Motion Simulators and Centrifuges

Motion simulator and centrifuge systems are generally motion-based power driven control systems. Smoothness of operation, high reliability, and man-rating, for long or short-term operation are required. Issues such as cross-coupling and structural resonance of large-payload, multiple-degrees-of-freedom motion systems shall be addressed. These control systems usually involve velocity and acceleration controls of motor drives and hydraulic actuators.

#### 3.4.2.4.4 Autonomous Robotic Systems

This work includes exploring new concepts utilizing advanced technology, customized prototype design, subminiature control hardware, and microprocessor-based control systems and embedded controllers. Most systems utilize embedded software.

#### 3.4.2.4.5 Environmental Control Systems

Environmental control systems are typically required for maintaining parameters such as temperature and humidity for airborne instruments, wind tunnels, and life science experiments flying aboard spacecraft.

3.4.2.4.6 Spacecraft Guidance Navigation & Control Systems (GN&C)

Spacecraft GN&C are typically required for spacecraft attitude control to achieve an end orbit or position in space, orbit maintenance to perturbations, and pointing control. Depending on the size and complexity of the spacecraft and

mission objectives, GN&C may be accomplished with the use of multiple reaction wheels and/or attitude control thrusters.

#### 3.4.2.5 Data Acquisition Systems

Designs for data acquisition systems typically include selecting commercial sensors and data acquisition equipment, developing needed custom software and hardware, and performing data collection for analysis. Data acquisition systems are used to collect large amounts of data from research facilities, models or experiments.

#### 3.4.2.6 Communication Systems

Designs for communication systems typically include transmitters and receivers, serial communications, satellite communications, spacecraft communications, information systems, Ethernet communications, radio communications, Internet interfaces (including wireless), and custom hardware/software development.

#### 3.4.2.7 Software and Firmware Systems

This work includes developing system software and firmware, test software and firmware, Internet products, custom or off-the-shelf data bases, data analysis, design tools, project related IT structure, upgrades to existing software/firmware and developing research models for conceptual designs. Flight and other critical software development may be required (per CTO) to be of CMMI Level 2 quality.

#### 3.4.2.8 Software Systems Engineering

These applications are infusions of technology developed through research. A focus of this area is to apply standard engineering practices to deliver reliable applications, within schedule, and within budget.

The Contractor shall support the ARC objective to develop missions in less time, at lower cost, and capable of delivering highly useful scientific and technical payloads in order to aid future NASA missions. One of the primary goals is to develop the capability within NASA to have space vehicles that could be deployed faster and cheaper than conventional spacecraft today in order to expand the number of flight opportunities and to take advantage of the latest technologies through shorter development cycles.

#### 3.4.2.9 Software Engineering

The Contractor shall support Software Engineering objectives. Software engineering is focused on the development and infusion of advanced software engineering tools into NASA missions.

The Contractor shall provide support of software development and test activities including, but not limited to: monitoring integration, auditing the software development and configuration management processes, participation in software reviews, and systems and software technical interchange meetings.

The Contractor shall notify ARC as to whether open source software will be included in code developed for projects. As required under individual task orders, the Contractor shall include software traceability data linking requirements, design, software, and tests in any required software product documentation.

### 3.4.3 Information Technology

Information technology shall be applied to a variety of projects such as Air Traffic Management System tools, Constellation Data Systems, smart and expert systems, and neural-networks and technology development efforts where advanced artificial intelligence and related information technologies shall be utilized to ensure that complex systems are designed and operated safely.

## 3.5 Hardware Development and Fabrication

The Contractor shall provide mechanical and electronic fabrication services, inspection services, and machinery maintenance and repair. Work shall predominantly be performed at the Applied Manufacturing Division (RM) shops at ARC. Some work shall be performed at other ARC organizational shops.

### 3.5.1 Hardware Development

The contractor shall support the development of hardware, which includes flight hardware, flight support equipment, orbital support equipment, ground support equipment, experiment ground control hardware, training hardware, experiment unique equipment, test related equipment, ground facility related equipment, and the associated software.

The contractor shall support all phases of hardware development including concept definition and development, requirements definition, analysis, design, development, systems engineering, fabrication, assembly, integration, testing, verification, delivery, maintenance, repair, refurbishment, and documentation. This support shall also include modification and refurbishment of existing hardware.

The contractor shall develop and maintain schedules for design, development, fabrication, procurement, testing, and installation of hardware to support missions, projects, and payloads. The contractor shall perform engineering analyses and prepare reports to support mission, project, and payload planning.

The contractor shall utilize a proven cost modeling system to provide cost estimates for design, development, fabrication, and testing of hardware. The contractor shall develop options and provide cost-benefit analysis for these options. The contractor shall document materials identification, selection, and certification in order to meet NASA project policies and requirements. The contractor shall provide support for hardware interface definition and for the baselining process for interface control drawings. The contractor shall track the design, fabrication, testing, and delivery of hardware and maintain configuration of such hardware. The contractor shall comply with all NASA safety policies and requirements.

The contractor shall ensure calibration of specified hardware by NASA designated certified calibration services.

**3.5.2 Research Hardware**

The Contractor shall provide fabrication services for the manufacturing, modification, repair, and installation of experimental research hardware. Expertise is required in conventional and/or CNC machining, bonding, forming, riveting, bending, and welding various materials, such as carbon, stainless, alloy, and structural steels; Monel, Invar, Vascomax, titanium, molybdenum, aluminum, brass, copper, nickel, and bronze; as well as resins, fiberglass, ceramics, plastics, wood, polymers, elastomers, and composite materials. The research hardware will be used in such applications as aircraft and spaceflight payloads, small spacecraft, acceleration facilities (centrifuges), wind tunnels and test models, man-rated systems, and various astrobiology and nanotechnology projects.

The Contractor shall operate equipment that ranges from hand tools to CNC machinery as described in Section J, Attachment A4, Government Furnished Equipment (GFE). Welding tasks may require certification to American Welding Society (AWS D1.1) standards.

**3.5.3 Research Electronics**

The Contractor shall provide fabrication services for the manufacturing, modification, repair, and installation of research electronics. Tasks include printed circuit board (PCB) layout design, fabrication, assembly, test, and repair; chassis fabrication and wiring, and cable harness fabrication; troubleshooting with and without schematics, and modifying existing designs to meet new requirements. The decision to make or buy

(outsource) these services will be made in concert with the Government. However, this decision must provide the most advantageous cost and schedule benefit to the Government. The Contractor shall meet NASA's requirements for workmanship and electrostatic discharge control as specified in the CTO or engineering design package.

### 3.5.4 Inspection Services

The Contractor shall provide inspection services for research hardware and research electronics. Certification to American Society for Quality (ASQ) standards for the mechanical inspector may be required. Certification to the NASA or industry standards for electronics inspector may be required.

### 3.5.5 Machinery Maintenance and Repair

The Contractor shall provide machinery maintenance and repair, including preventive maintenance, inspection, alignment, and rebuilding of all mechanical and electrical aspects of all shop equipment. This equipment is located in Machine Shop (Building 220), Sheet metal Fabrication Shop (Building 211), Non-metallic (Composite) Fabrication Shop (Building 212), Space Projects Buildings (Buildings 244 and 240), and the Facilities Electronics Services Shop (Building 220). This equipment is listed in Section J, Attachment A4, Government Furnished Equipment (GFE). Additional equipment requiring service will be added to the list as required.

## 3.6 Integration & Testing

For new or existing systems the Contractor shall perform systems integration, develop test plans and procedures, develop test fixtures and systems, debug hardware/firmware/ software systems, collect, analyze, and present test data, and provide reports and recommendations based on the collected test data. The Contractor may be tasked to participate in acceptance and verification testing under the auspices of the System Safety & Mission Assurance Office at ARC.

## 3.7 Engineering Evaluation Laboratory

The Contractor shall operate and maintain the Engineering Evaluation Laboratory (EEL) at ARC. The Contractor shall plan and perform the following for spacecraft and ground based hardware: 1) vibration, thermal vacuum, environmental qualification, structural, impact, and pressure tests, and performs proof loads and modal testing with resonant frequency analysis; 2) strain gage selection, installation, and data acquisition, reduction, analysis, and reporting; and 3) specialty work including installation and testing of all types of engineering measurement sensors, such as accelerometers, pressure transducers, load cells, inclinometers, rate gyros, and temperature and acoustic sensors. The Contractor shall design and fabricate test fixtures and equipment when required to conduct specialized tests.

The Contractor shall also develop and follow stringent verification and validation procedures for spaceflight hardware and support pre- and post- test reviews as necessary.

The Contractor shall keep the EEL clean and free from debris and metal shavings; utilize LabView system for data acquisition and report generation; oversee calibration all EEL equipment whether performed inhouse or by an outside vendor; complete and follow maintenance plan for all test equipment; develop and maintain a binder for each piece of test equipment including calibration, maintenance procedures, operating procedures, emergency shutdown procedures, and detailing all known risks when operating the equipment.

### 3.8 Ground Facilities

The contractor shall provide support for planning, development, maintenance, and operation of ground facilities and equipment. Ground facilities include test areas, assembly and integration areas, ground data systems, mission operations areas, science operation areas, shop areas, laboratory areas, secure storage areas, and stock rooms.

#### 3.8.1 Ground Facilities, Maintenance, and Operations

The contractor shall provide engineering and technical support for maintenance and operation of ground facilities and equipment. The contractor shall operate ground facilities in accordance with mission and flight requirements. The contractor shall provide information for facilities interface documents.

The contractor shall provide support involved in the preparation of test facilities to ensure their compatibility (e.g., power, temperature, humidity, availability of utilities, and accessibility) with the hardware to be tested. Government-provided test facilities and equipment may include video and voice communication equipment, telemetry and data processing systems, shop support areas (mechanical and electrical), and biological laboratories. The contractor shall verify, repair, or modify the test equipment and facilities. Such facilities and equipment may include applicable hardware test equipment, flight support equipment, ground racks, ground support equipment, and laboratory support areas.

The contractor shall maintain and operate test and facility-related support equipment including: facility data distribution networks, special test equipment (such as weight and balance system, environmental control system cart, rack shipping containers, and ground racks), and ground support equipment for laboratory and shipping operations.

The contractor shall provide support for individual missions in the operational testing and verification of the readiness of the Space Experiments Research and Processing Laboratory (SERPL) at KSC and the Payload Receiving Facility (PRF) and Payload Processing Facilities (PPF) at DFRC. This support shall include review of facility provisions, assessment of mission requirements, and coordination with KSC facility

personnel to ensure that the requirements are met. Prior to each mission, the contractor shall provide information for a facility interface document which details equipment provided by KSC, equipment provided by ARC at the landing sites, interface requirements of ARC equipment, and schedule of equipment use and operations to be performed in the SERPL, PRF, and PPF.

The contractor shall provide engineering and technical support for flight and post-flight recovery operations at NASA landing sites. This support shall include review of facility provisions, assessment of requirements for each mission, and verification that the requirements are met.

### 3.9 Mission Operations

The contractor shall perform tasks for flight mission operations for specific missions, payloads, experiments, and Space Station increments. The contractor shall provide support for experiment staging, ground and flight operations, and post-mission support. This support shall include information exchange with other NASA organizations and contractors; document generation and update; staffing plan development and implementation; voice, video, and telemetry data processing and systems operation; anomaly identification, analysis, and resolution; and post-mission support, report generation, and data archiving.

### 3.10 General

#### 3.10.1 Shift and Hours of Work

Most tasks associated with this SOW shall be performed on-site on the first shift, but second and third shift support may also be required. There may be occasional requirements to work weekends and/or holidays. Requirements for services to be performed beyond the normal work schedule will be coordinated between the COTR and the Contractor prior to their performance.

NASA Civil Servants have an option to work an alternate compressed schedule. This option will be made available to the Contractor provided that the cost and services are not affected.

#### 3.10.2 Contractor-Furnished Equipment

The Contractor shall furnish the following:

a) Shop coats/coveralls and laundry service for tasks involving Code RM shops

b) All Personal Protective Equipment with the exception of breathing respirators in accordance with the Ames Safety and Health Manual located at http://q/safetymanual/index.php.

## 4.0 CONTRACT MANAGEMENT

The Contractor shall provide management and administrative functions necessary to effectively and efficiently manage the work performed under this contract. The Contractor shall have an organizational structure, procedures, and administrative support functions to effectively and efficiently manage the work performed under this contract. The Contractor shall also provide any required electronic input to the accounting system of Code RE (Serv E) and reconcile differences between the Contractor's and Code RE's financial reports.

The management and administrative structure shall provide a single point of contact for interface to the Contracting Officer's Technical Representative (COTR) and shall provide procedures and management supervision to ensure compliance with applicable Government policies, regulations, and contractual requirements for all work performed under this contract. Each task shall have a Task Manager who shall be the single point of contact with the Task Requester.

The Contractor shall be responsible for procuring substantial quantities of components, materials, equipment, parts, supplies and services in order to accomplish assigned CTOs. The Contractor shall submit a procurement plan for purchasing the aforementioned items, to be approved by the Contracting Officer. The Contractor's procurement policies and procedures shall conform to all applicable Government and NASA procurement regulations and policies.

The Contractor shall be prepared to adjust the staffing level to accommodate the actual workload, i.e., hire and/or lay off staff as required within a reasonable time frame.

## 5.0 TASK ORDER MANAGEMENT

The Government will use a completion form Contract Task Order (CTO) as the vehicle to acquire necessary products and services. Each assigned CTO will contain defined requirements, deliverables, milestones, and performance metrics. Standards and Codes unique to the task will be specified in the CTO and/or engineering design package; examples of some applicable Standards and Codes are shown in Appendix 1.0.

For other NASA centers or Government agencies that wish to have work accomplished under this contract (through the Consolidated Contracting Initiative), a task order must be written and follow the same basic flow as shown in Appendix 2.0.

The Contractor shall provide a Task Plan for each assigned CTO or CTO modification with the following information:

1) A discussion of the approach for performing the work, including technical approach, risk assessment, and any ancillary deliverables defined by the Contractor (if required).
2) Milestone Schedule.
3) An estimate of labor hours and skill mix by applicable labor category, extrapolated on a monthly basis.
4) The total estimated cost and award fee for completion of the CTO, including:

a) Direct Labor Hours.
b) Direct Labor Cost.
c) Other Direct Costs (ODCs) including, but not limited to materials, equipment, travel and subcontracting.
d) Indirect Costs.
e) Maximum Available Award  Negotiated Fee(s) for the Task.

Flow charts detailing the CTO process are shown in Appendix 2.0 to the SOW.

**6.0 PHASE-IN/PHASE-OUT PLAN**

The contractor shall provide the Government with a Phase-In Plan and a Phase-Out Plan describing the technical and management approaches the contractor will take to ensure a successful transition both in starting and ending the contract.

Appendix 1.0

**STANDARDS and CODES**

The nature of the research work at Ames dictates that we comply with many different current standards and codes.  Those that are applicable will be called out on the CTO or engineering design package.  Typical standards and codes that may be imposed on the Contractor are listed below.

1. ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code
2. ASA (Acoustical Society of America) Codes as sponsored by the ASME
3. Department of Transportation regulations
4. NEC (National Electric Code)
5. Military Specifications and Standards

6. ASTM (American Society of Testing and Materials) Standards
7. NASA and Ames Research Center Standards and Procedures.
8. Mechanical and Structural Design Manual for the Systems Engineering Division, Ames Research Center.
9. ANSI (American National Standards Institute) Standards
10. IEEE (Institute of Electrical and Electronic Engineers) Standards.
11. AWS (American Welding Standards)
12. EDC (Engineering Documentation Center) Document Standards
13. NHB 1700.1 (V1-B), NASA Safety Policy and Requirements Document
14. Ames Environmental Handbook (APG 8800.3) http://q.arc.nasa.gov/